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THE FIRST LUNAR LANDING

As Told by The Astronauts

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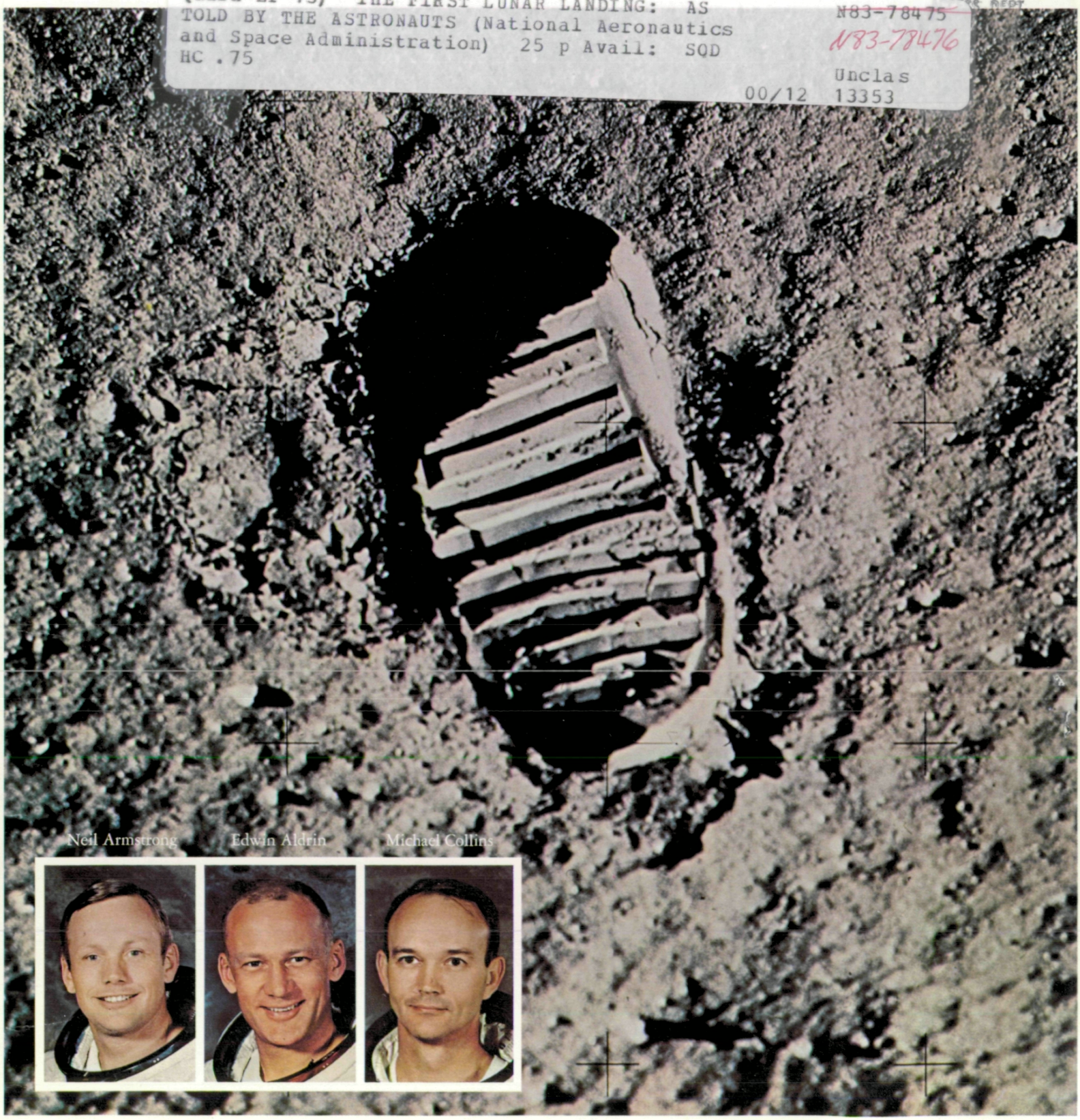


The First Lunar Landing

As Told by the Astronauts Armstrong, Aldrin, and Collins in a Post-flight Press Conference

Introduction

At 10 a.m. CDT, August 12, 1969, Julian Scheer, NASA's Assistant Administrator for Public Affairs, opened the televised Apollo 11 post-flight press conference in the auditorium of the Manned Spacecraft Center, Houston, Texas. Addressing some two hundred representatives of the news media from the United States and abroad, he said:

"Ladies and gentlemen. Welcome to the Manned Spacecraft Center. This is the Apollo 11 press conference. The format today will consist of a 45-minute presentation by the Apollo 11 crew, followed by questions and answers. At this time, I would like to introduce the Apollo 11 crew, astronauts Neil Armstrong, Michael Collins, and Edwin Aldrin, Jr."

Neil Armstrong, commander of Apollo 11, began the first-hand report to the world of the epic voyage of Eagle and Columbia to the Moon and back to Earth.

The voyage began at 9:32 a.m. EDT, July 16, when a Saturn V rocket launched Apollo 11 into Earth orbit from Cape Kennedy. After one and a half orbits of the Earth, the third stage of the Saturn V refired to send Apollo on its outward journey to the Moon. Shortly afterward, the command/service module, called Columbia, separated from the Saturn third stage, turned around, and connected nose to nose with the lunar module, called Eagle, which had been stored in the third stage. With Eagle attached to its nose, Columbia drew away from the third stage and continued toward the Moon.

On July 19, Apollo 11 neared and went behind the Moon. At 1:28 p.m. EDT, it fired its service module rocket to go into lunar orbit. After 24 hours in lunar orbit Armstrong and Aldrin separated Eagle from Columbia, to prepare for descent to the lunar surface. On July 20 at 4:18 p.m. EDT, the Lunar Module touched down on the Moon at Tranquility Base. Armstrong reported "The Eagle Has Landed." And at 10:56 p.m., Armstrong, descending from Eagle's ladder and touching one foot to the Moon's surface, announced:

"That's one small step for a man, one giant leap for mankind."

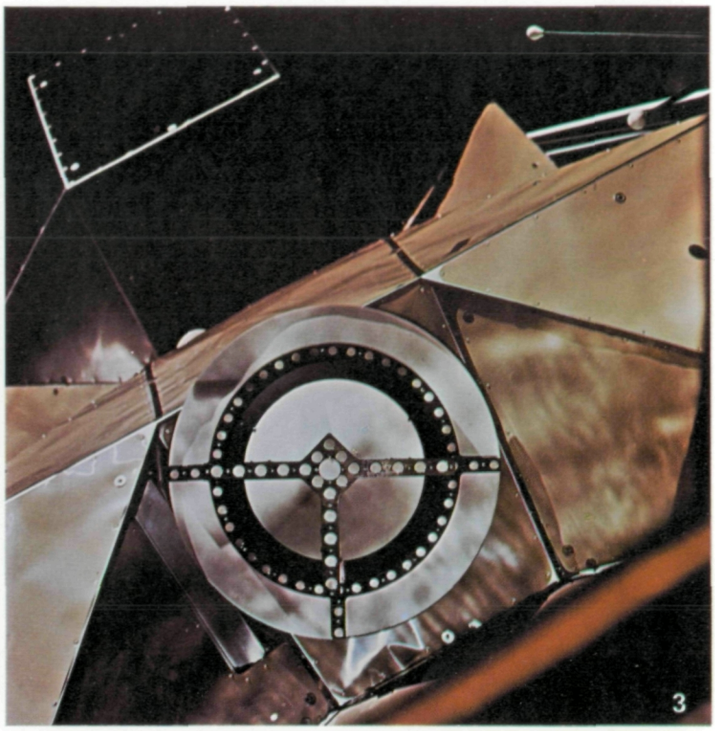
Aldrin soon joined Armstrong. Before a live television camera which they set up on the surface, they performed their assigned tasks.

Man's first dramatic venture on the lunar surface ended at 1:54 p.m., July 21 when Armstrong and Aldrin lifted off from the Moon on a tower of flame. They rejoined Eagle to Columbia, in which Collins had waited for them, in lunar orbit. They returned to Columbia and cast Eagle adrift.

The astronauts then fired their service module rocket to break from the Moon's gravitational grip and head for home. They reached Earth's vicinity at a speed of about 25,000 mph, threaded their way into its atmosphere to avoid burning up or bouncing back into space, and finally with parachutes billowing landed in the Pacific Ocean southwest of Hawaii at 12:51 p.m. EDT, July 24.

This volume is a transcript of the Apollo 11 post-flight press conference. It's a description of man's historic first trip to another celestial body by the men who made the journey.

2



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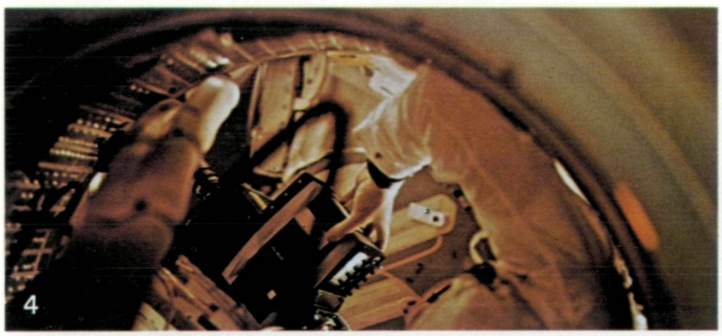
ARMSTRONG It was our pleasure to participate in one great adventure. It's an adventure that took place, not just in the month of July, but rather one that took place in the last decade. We had the opportunity to share that adventure over its developing and unfolding in the past months and years. It's our privilege today to share with you some of the details of that final month of July that was certainly the highlight, for the three of us, of that decade. We're going to talk about the things that interested us most and particularly the things that occurred on and about the Moon. We will use a number of pictures, with the intent of pointing out some of the things that we observed on the spot, which may not be obvious to those of you who are looking at them from the surface of Earth. The flight as you know started promptly, and I think that was characteristic of all the events of the flight. The Saturn gave us one magnificent ride, both into Earth orbit and on a trajectory to the Moon. *(Photo 1.)* Our memory of that actually differs little from the reports that you have heard from the previous Saturn V flights and the previous flights served us well in preparation for this flight in the boost as well as the subsequent phases. We would like to skip directly to the translunar coast phase and remind ourselves of the chain of events—that long chain of events—that actually permitted the landing, starting with the undocking, the transposition and docking sequence.

COLLINS This was our first look at the magnificent machinery which had been behind us until this point. The booster—of course the first and second stages had long since separated, but this shows the LM—that's the LM inside of the third stage (the S-4B) after the translunar injection burn. *(Photo 2.)* This maneuver was an interesting combination of manual and automated techniques in that we programmed the onboard computer to make the turnaround. Then the final maneuvers were made completely manually. As I approached the LM I had an easy time because I had a docking target *(Photo 3)* which allowed me to align the probe and the drogue. During this time, I also checked out the proper vehicle response to my strict inputs.

ALDRIN We made two entries into the lunar module. This is the first view of the inside of this. *(Photo 4.)* The final activation was made on the day of power descent and on the two previous days when we entered, we removed the probe and drogue, and found that we had a rather long tunnel between the two vehicles. In entering the lunar module one has to do a slight flip maneuver or a half gainer to get into position, for the lunar module is in a sense upside down relative to the command module.

COLLINS This is in lunar orbit after separation of the lunar module from the command module as viewed through my window. *(Photo 5.)* This was a busy time for me in that I was taking motion pictures through the right hand window at the same time I was taking still photos through the left hand window and also flying my vehicle—and probably poorly—and taking a close look at the LM as he turned it around. My most important job here was to make sure that all his landing gear was down and properly locked prior to his descent and touchdown. Next came his yaw maneuver and the white dots that you see are the landing gear pads. This shows the LM—either right side up or upside down—I'm not sure which. It looks more to me like a praying mantis than it does a first class flying machine in this view, but it was a beautiful piece of machinery. The landing gear is at the top and you can see the probes which indicate lunar contact as thin wires extending upward from the landing gear.

ALDRIN Of course before we could undock we had to complete the activation. Now the day before we undocked we entered the LM and went through an entire switch configuration check and we exercised the various communication modes. In retrospect, since we did have a little bit of a communication problem during power descent, we would recommend that we might make a more thorough check of this on the day before descent. On the day that we did finally enter the LM for the landing maneuver we went through a staggered sequence of suiting and we found that with all the simulations that we had run back in Houston —or with Houston tied with our simulations at the Cape— that we were quite confident that we would be able to complete this LM activation in the given time period (which was approximately 4 hours). We managed to get 30 minutes ahead of the time and it allowed us to get a more accurate platform alignment check at one point. After the undocking maneuver we went through a brief radar check and then the command module executed a 2 foot-per-second maneuver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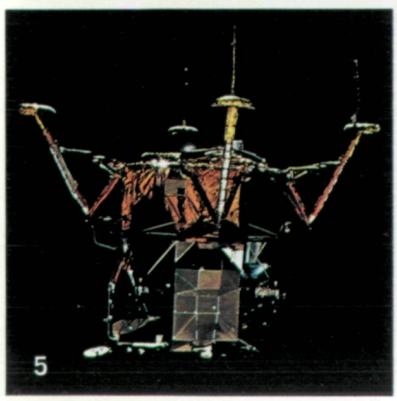
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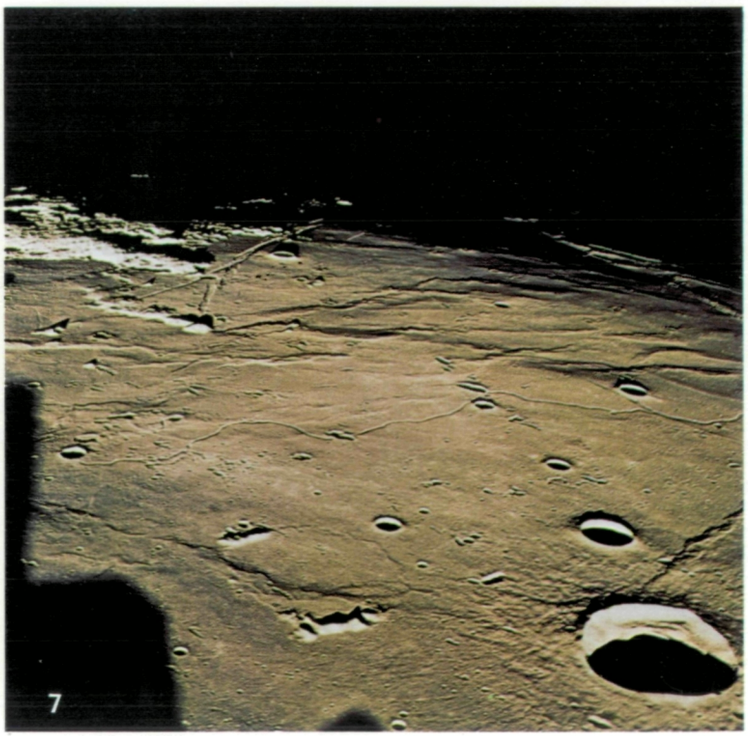
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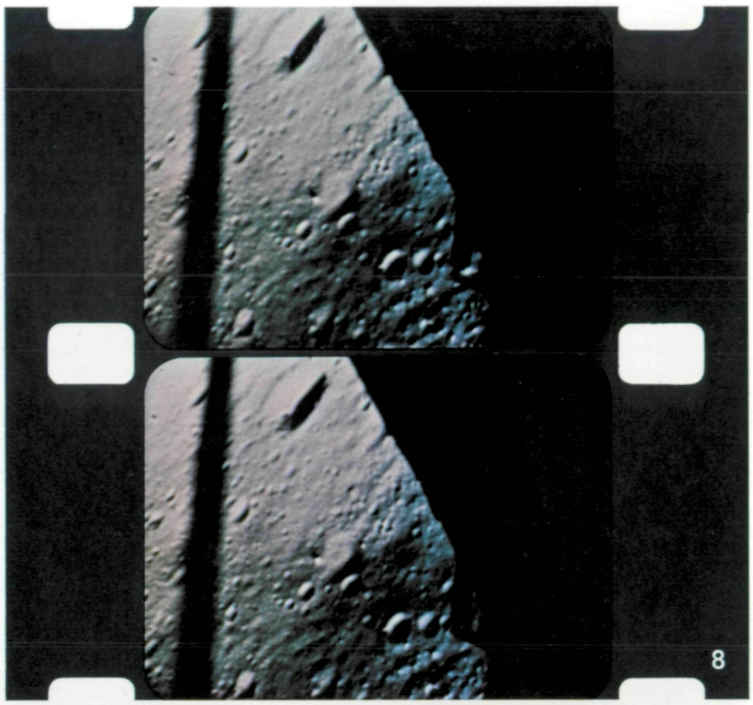
away from us so that we would both be able to independently exercise our guidance systems through a star alignment check which we did following this separation maneuver. *(Photo 6.)* Soon after we were in the vicinity close to the landing site and then the command module was traveling right over the center of our targeted point. It approached what we call the Cat's Paw. Following this separation maneuver on the back side of the Moon we made a descent orbit insertion which was slightly over 70 feet per second that lowers our altitude down to 50 thousand feet. We had two guidance systems working for us. They behaved perfectly. Both of them agreed extremely closely as to the results of this maneuver. Following this we used the radar to confirm the actual departure rate from the command module.

ARMSTRONG This is a view of the descent trajectory area as viewed through the LM window during our activation. *(Photo 7.)* In the bottom right of the photograph is the crater Maskelyne and the bottom center is the mountain called Boot Hill. Immediately above Boot Hill is a small sharp-rimmed crater called Maskelyne W which was the crater we used to determine our downrange and crossrange position prior to completing the final phases of the descent. The landing area itself is in the smooth area at the top of the picture just before we arrive at the shadow or what is called the terminator. We had seen a number of pictures from Apollo's 8 and 10 which gave us an excellent understanding of the ground track over which we would pass during the descent. The crater Maskelyne W appeared approximately two to three seconds late and gave us the clue that we would probably land somewhat long. After completing those position checks we rolled over face up so that the landing radar could lock on the ground and confirm our actual altitude. Now, at this phase in the trajectory we were pointed directly at the planet Earth. In the final phases of descent after a number of program alarms, we looked at the landing area and found a very large crater. *(Photo 8.)* The camera is located in the right window and looks to the right and it just barely sees the boulder field that we are passing over. We are at 400 feet and the boulders are about 10 feet across. This is the area which we decided we would not go into; we extended the range downrange and saw this crater which we passed over—this 80-foot crater—in the final phases of descent and later took some pictures of it. The exhaust dust was kicked up by the engine *(Photo 9)* and this caused some concern in that it degraded our ability to determine not only our altitude and altitude-grade in the final phases, but also, and probably more importantly, our translational velocities over the ground. It's quite important not to stub your toe during the final phases of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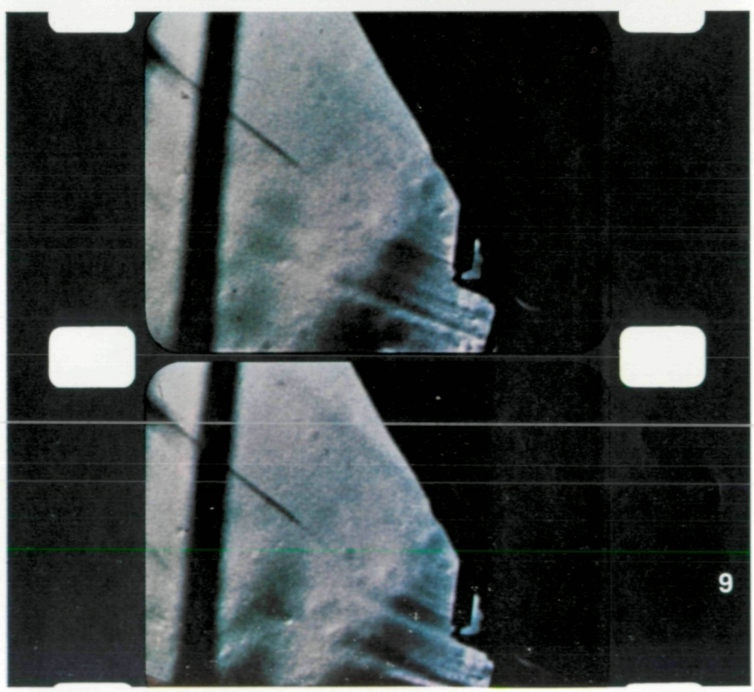
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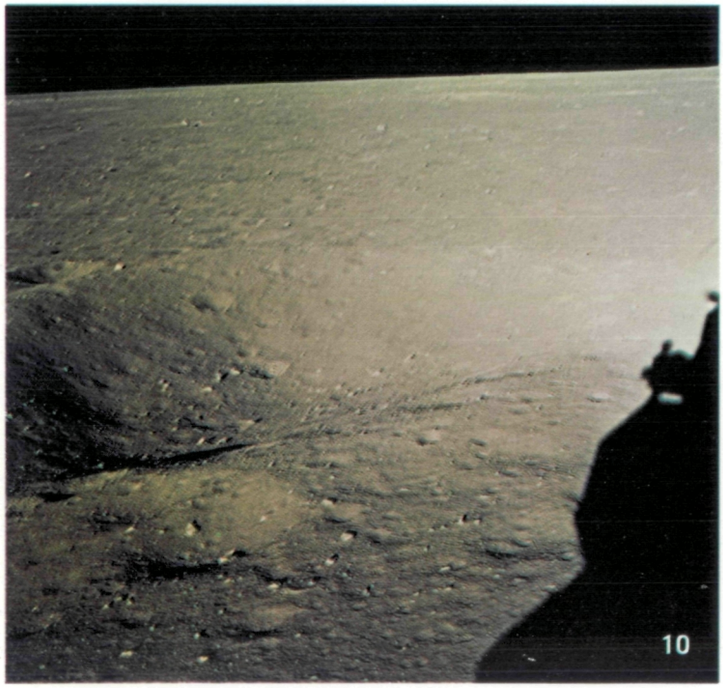
touchdown. Once settled on the surface, the dust settled immediately and we had an excellent view of the area surrounding the LM. We saw a crater surface, pock-marked with craters up to 15, 20, 30 feet and many smaller craters down to a diameter of 1 foot and, of course, the surface was very fine-grained. *(Photo 10.)* We could tell that from our view out the window, but there were a surprising number of rocks of all sizes.

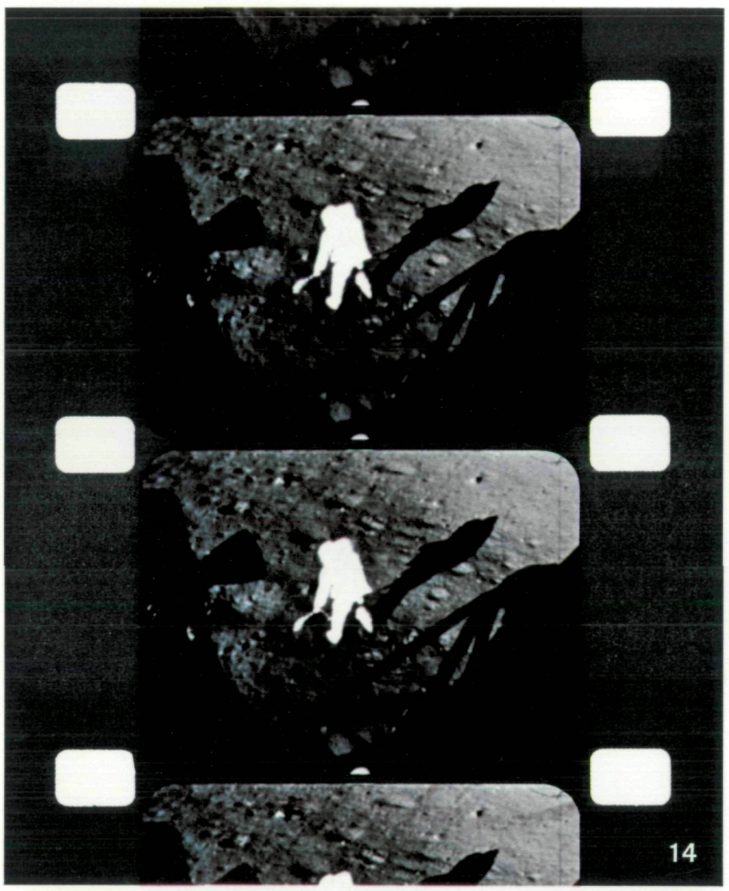
ALDRIN This is the view out the right window. *(Photo 11.)* Up close to the horizon you see a boulder field that was probably deposited by some of the impacts in the craters that were behind us. You see, most of the craters have rounded edges, however, there is a variation in the age of these as we can tell by the sharpness of the edge of the crater. The immediate foreground area we will see more of later. It was relatively flat terrain in contrast to some of the more rolling terrain that we could see out the front window and out the left window. This is the view looking forward along where the shadow of the LM is cast on the surface *(Photo 12)* and we see a zero-phased glow around the upper portion of the LM. The general color of the terrain looking down-Sun was a very light tannish color. This blended as we looked more cross-Sun to sharper, more well-defined features to more of a gray color. During the initial time period after touchdown, we went through various sequences to prepare us for immediate abort or liftoff, if



we found that this was necessary. We found that we had to vent the fuel and oxidizer manifolds a good bit earlier than we had thought. We went through these various checks and prepared for a liftoff that would have to occur about 21 minutes after the beginning of powered descent. The ground (network) gave us a stay during this period and we did not have to make use of that. We then proceeded, at that point, into our simulated countdown which consisted of checking our guidance systems. We made use of a gravity-align feature where the inertial platform of the primary guidance system would defuse the gravity vector to determine the local vertical. We then compared this with the alignments that we had previously. We also made use of the stars through the telescope in aligning a cross hair by rotating the field of view so the cross hair superimposed on the star—this would give us the angular measurement of the star within the field of view of the telescope. We then determined the distance out by aligning another radical spiral on this. We went through an averaging technique onboard and then fed this information into the computer and came up with our various alignment checks. This was all in preparation for a possible liftoff that would occur about two hours after touchdown as Mike and Columbia came over for the first revolution. The ground network gave us a stay and we continued through the remainder of the checklist in our simulated countdown and at this point we terminated and powered down the systems aboard the spacecraft and went into an eat period.

ARMSTRONG A number of experts had, prior to the flight, predicted that a good bit of difficulty might be encountered by people attempting to work on the surface of the Moon due to the variety of strange atmospheric and gravitational characteristics that would be encountered. This didn't prove to be the case and after landing we felt very comfortable in the lunar gravity. It was, in fact, in our view preferable both to weightlessness and to the Earth's gravity. All the systems on the LM were operating magnificently—we had very few problems. We decided to go ahead with the surface work immediately. We predicted that we might be ready to leave the LM by 8 o'clock, but those of you who followed on the ground recognize we missed our estimate a good deal. This was due to a number of factors: 1; we had housekeeping to perform (food packages, flight plans, all the items that we had used in the previous descent had to be stowed out of the way prior to depressurizing the lunar module) 2; It took longer to depressurize the lunar module than we had anticipated and 3; it also took longer to get the cooling units in our backpacks operating than we had expected. In substance, it took us approximately an hour longer to get ready than we had predicted. When we actually descended the ladder it was found to be very much like the

lunar gravity simulations we had performed here on Earth. No difficulty was encountered in descending the ladder. The last step was about 3½ feet from the surface, and we were somewhat concerned that we might have difficulty in re-entering the LM at the end of our activity period. So we practiced that before doing the exercise of bringing the camera down which took the subsequent surface pictures. Here you see the camera being lowered on what might be called the "Brooklyn clothesline." *(Photo 13.)* I was operating quite carefully here because immediately to my right and off the picture was a six-foot-deep crater. And I was somewhat concerned about losing my balance on the steep



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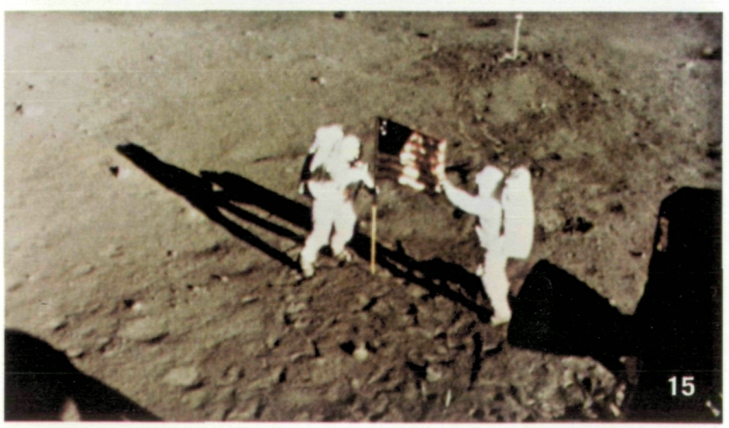

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slope. The other item of interest in the very early stages of EVA, should it have been cut short for some unknown reason, was the job of bringing back a sample of the lunar rocks. The photograph shows the collection of that initial sample into a small bag *(Photo 14)* and then that bag being deposited in my pocket. This was the first of a number of times when we found two men were a great help. I quickly put up the TV camera. And then more leisurely Buzz and I joined together to erect the American flag. *(Photo 15.)* We found on a number of occasions when we were able to help each other in many ways on the surface. You probably recall the times that I got my foot caught in the television cable, and Buzz was able to help me extract it without falling down.

ALDRIN We had some difficulty at first getting the pole of the flag to remain in the surface. In penetrating the surface, we found that most objects would go down about 5, maybe 6 inches, and then meet with gradual resistance. At the same time there was not much of a support force on either side, so we had to lean the flag back slightly in order for it to maintain this position. So many people have done so much to give us this opportunity to place this American flag on the surface. To me it was one of the prouder moments of my life, to be able to stand there and quickly salute the flag. *(Photo 16.)*

ARMSTRONG The rest of the activity seemed to be very rushed. There were a lot of things to do, and we had a hard time getting them finished.

ALDRIN We did find that mobility on the surface was in general a good bit better than perhaps we had anticipated it. There was a slight tendency to be more nearly toward the rear of a neutral stable position. Loss of balance seemed to be quite easy to identify. And as one would lean a slight bit to one side or the other, it was very easy to identify when this loss of balance was approaching. In maneuvering around, one of my tasks fairly early in the EVA, I found that a standard loping technique of one foot in front of the other worked out quite as well as we would have expected. One could also jump in more of a kangaroo fashion, two feet at a time. This seemed to work, but without quite the same degree of control of your stability as you moved along. We found that we had to anticipate three to four steps ahead in comparison with the one or two steps ahead when you're walking on the Earth.

ARMSTRONG We had very little trouble, much less trouble than expected on the surface. It was a pleasant

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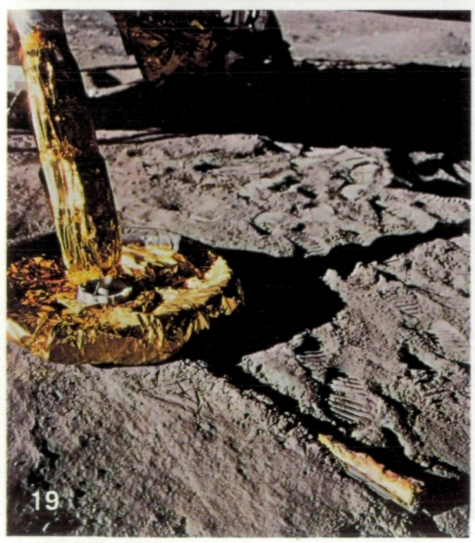

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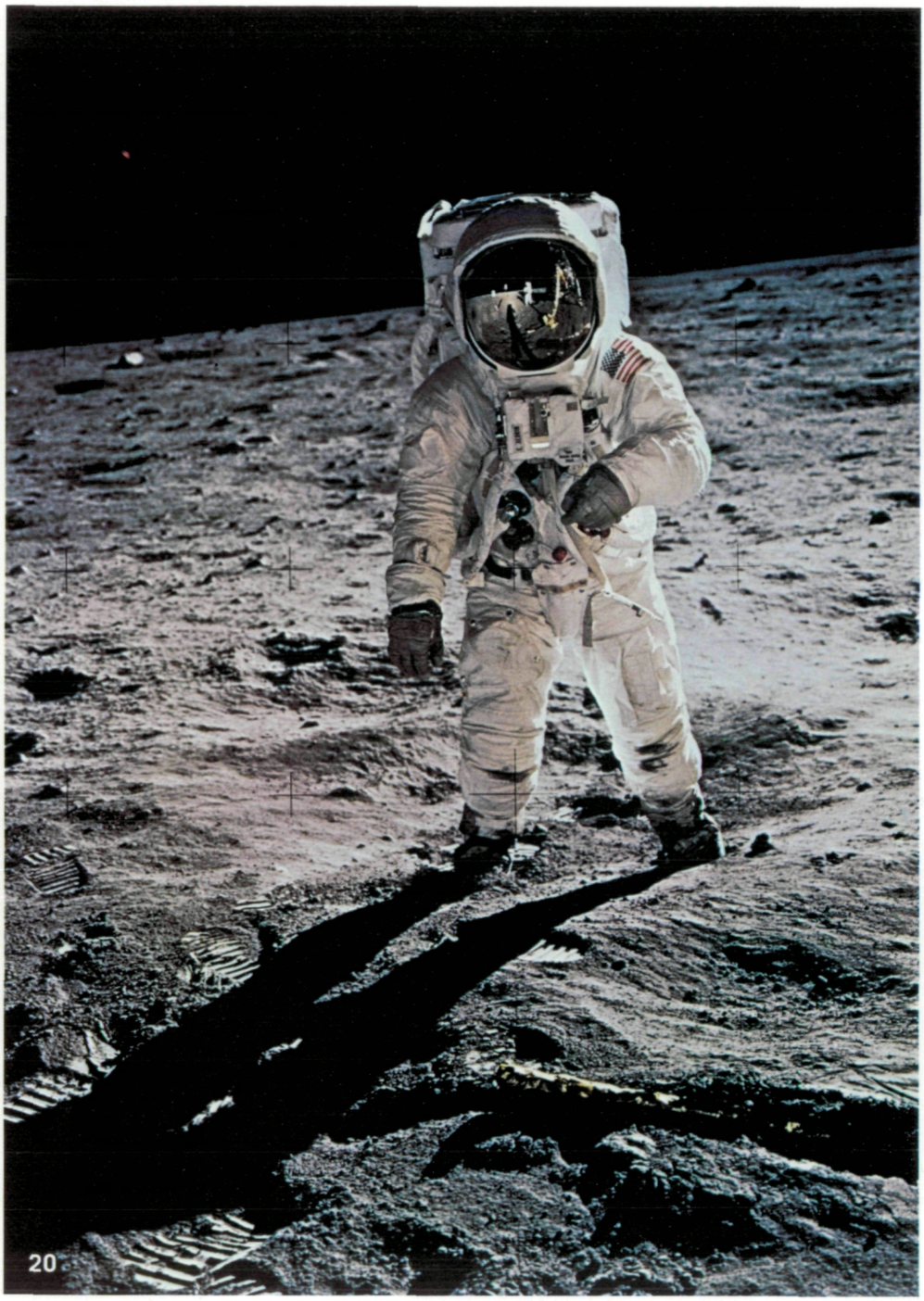

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operation. Temperatures weren't high. They were very comfortable. The little EMU, the combination of spacesuit and back pack that provided or sustained our life on the surface, operated magnificently. We had no cause for concern at any time with the operation of that equipment. The primary difficulty that we observed was that there was just far too little time to do the variety of things that we would have liked to have done. In earlier pictures, you saw rocks and the boulder field out Buzz's window that were 3 and 4 feet in size—very likely pieces of the lunar bedrock. And it would have been very interesting to go over and get some samples of those. There were other craters that differed widely, that would have been interesting to examine and photograph. We had the problem of the five-year-old boy in a candy store. There are just too many interesting things to do. The surface as we said was fine-grained with lots of rock in it. It took footprints very well, and the footprints stayed in place. *(Photo 17.)* The LM was in good shape, and it exhibited no damage from the landing or the descent. Here is a picture of the ladder with the well-known plaque on the primary strut. *(Photo 18.)* There was a question as to whether the LM would sink in up to its knees. It didn't, as you can see. The footpads sunk in, perhaps, an inch or two. And the probe in this picture was folded over and sticks up through the sand in the bottom right-hand corner *(Photo 19)* showing that we were traveling slightly sidewise at touchdown. There was a wide variety of surfaces. Here Buzz is standing in a small crater *(Photo 20),* and gives a very good picture of the rounded rims of what we believe are very old features. The LM was in a relatively smooth area between the craters and the boulder field. *(Photo 21.)* And we had some difficulty in determining just what straight up and down was. Our ability to pick out straight up and down was probably several degrees less accurate than it is here on Earth. And it caused some difficulty in having things like our cameras and scientific experiments maintain the level attitude we expected.

ALDRIN The two experiments that you saw in the previous picture were deployed in the Scientific Equipment Bay. We found that getting them down produced no significant problem. And here you see a view of my carrying these two experiments out to the deployment site *(Photo 22),* about 70 feet south of the lunar module. You have a very good view of the varying depths of the upper surface layer. You see that along the crater rim—a small crater rim off to my left—along this, the upper surface appears to be about 2 to 3 inches. The subsurface has a slope that is rather ill-defined, and one has to be very careful in treading around these small


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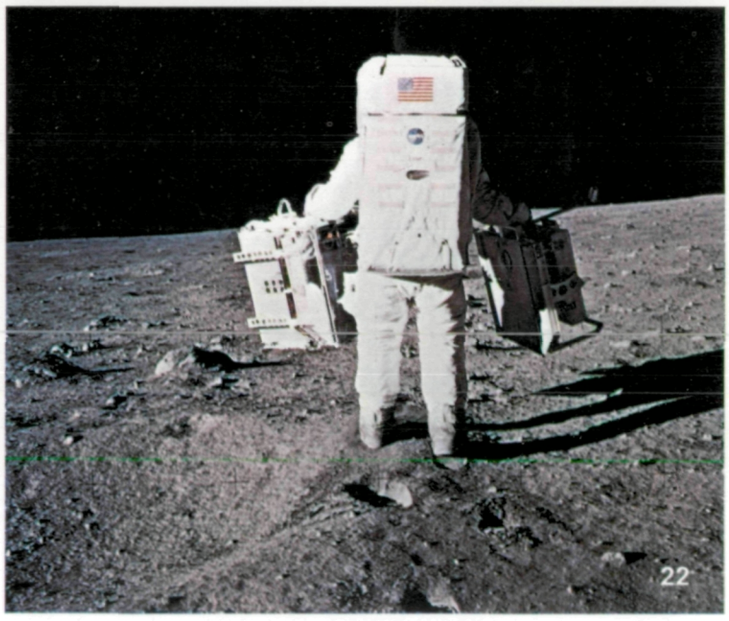
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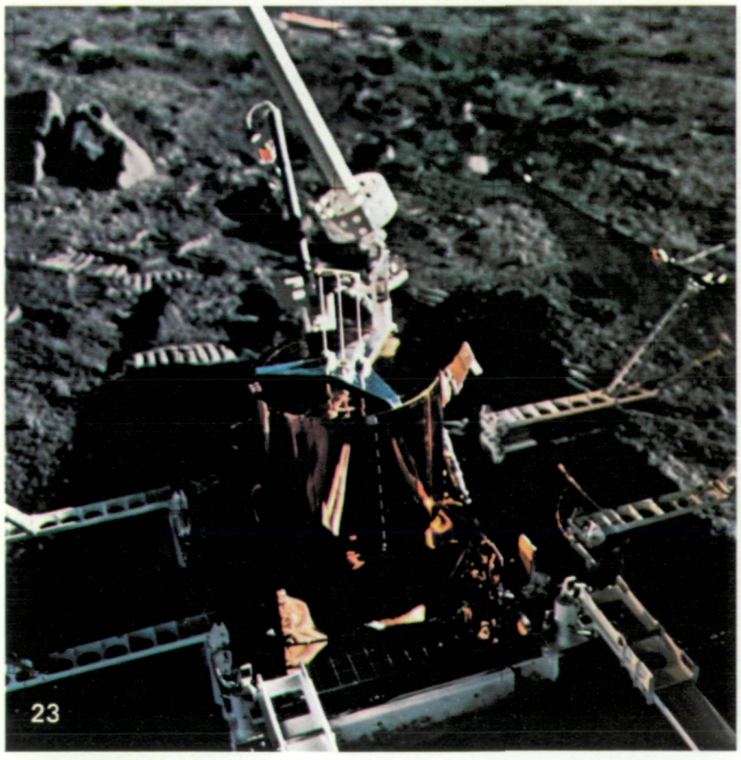
craters. Any long excursions, I feel, would take a good bit of attention in moving along to avoid walking along or down the slope of some of these smaller craters. This is the Passive Seismic Experiment *(Photo 23)* that was deployed and has been giving us good returns on the interactions of the Moon. We had a little difficulty deploying one of the panels. I had to move around to the far side and release the restraining lever, and then the second panel came out. We had a little bit of difficulty determining, as Neil said, the exact local horizontal, and I think this is due to the decrease in the cues, that a person has as to which way up really is. One has to lean a little bit more off to the side before you get this body cue that your approaching off-balance, and of course the surface varied considerably in this area. This second experiment is the Laser Reflector. *(Photo 24.)* We've been successful in bouncing laser beams off this, from its hundred arrays of reflectors. The other experiment, the Solar Wind Experiment *(Photo 25)*, you can see, was de-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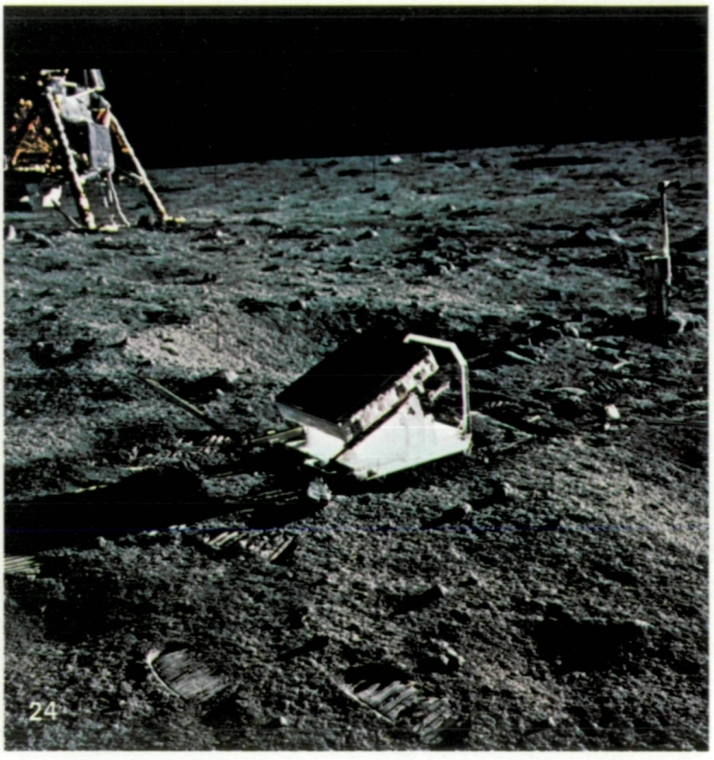
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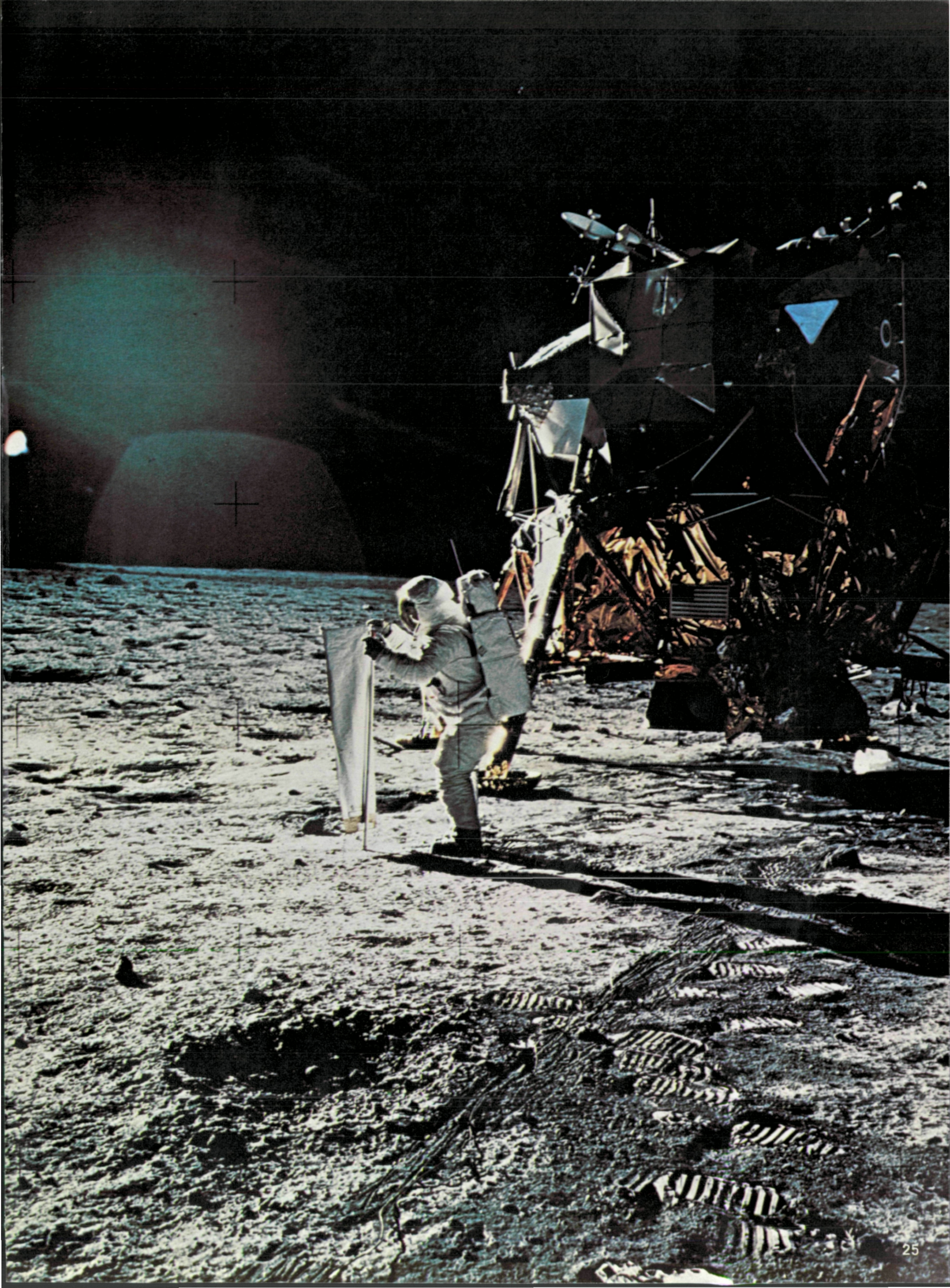
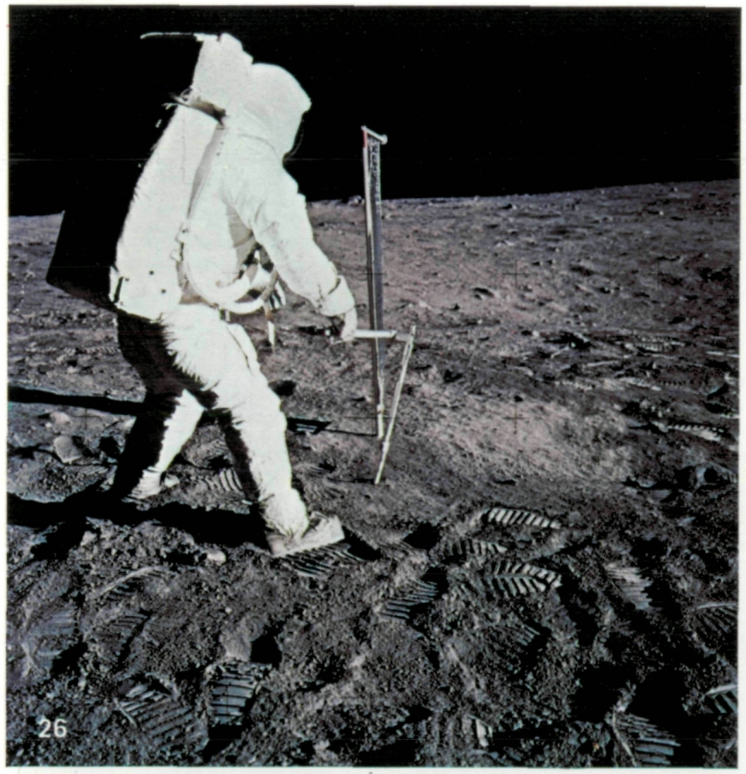
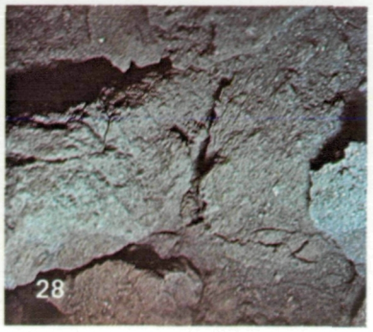
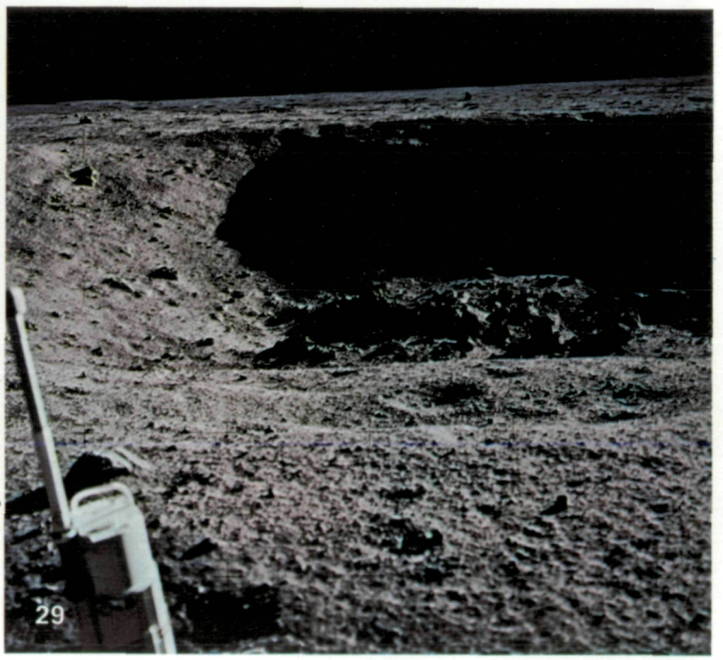






ployed quite early in the flight and was rolled up, just one of the last things before I reentered the LM. In this picture, you see me driving the core tube into the surface. *(Photo 26.)* We collected two different core tube samples. It was quite surprising, the resistance that was met in this subsurface medium, and at the same time, you see that it did not support very well the core tube as I was driving it into the surface.

ARMSTRONG This is a closeup picture. *(Photo 27.)* It's actually a stereo picture of fine particulate material on the Moon. This is taken from about an inch or two away from the surface, and shows a shiny coating on some of the clumps there. This appears to be melted glass and an analysis of the cause for that characteristic is of extreme interest to the scientific community. The second picture taken with that scientific camera shows the nature of the clods



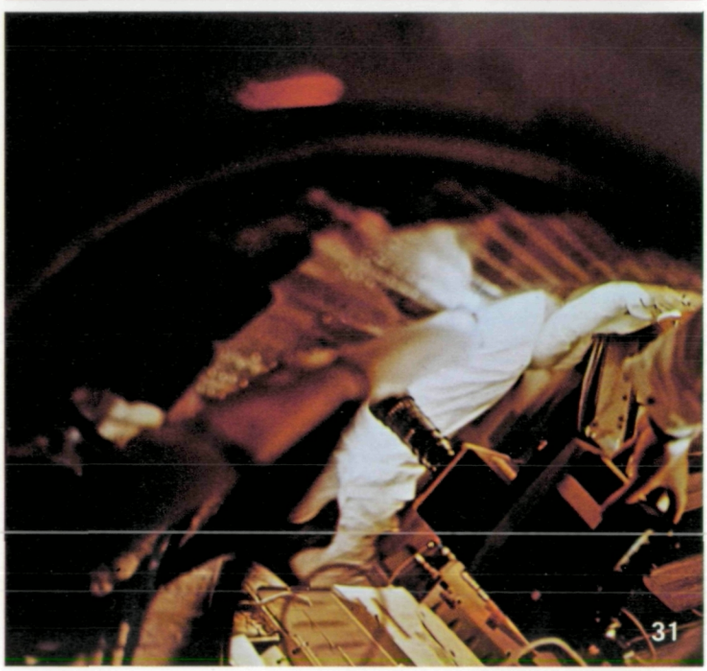
of lunar surface material *(Photo 28),* and this picture shows the 80-foot crater, which, you observed earlier during the final phases of descent *(Photo 29).* We had very much hoped that this crater would be deep enough to show the lunar bedrock. It was about 15 or 20 feet deep, and although there are rocks in the bottom, there is no evidence on the inner walls of the lunar bedrock.

ALDRIN We deposited several items on the lunar surface. I'm sure you're aware of these. One was a disc with 73 messages from nations of the world. There was a patch from Apollo 1, and various medals from the cosmonauts. We also elected, as a crew, to deposit a symbol which was representative of our patch; that is, the U.S. eagle carrying the olive branch to the lunar surface. We thought it was appropriate to deposit this replica of the olive branch before we left.

ARMSTRONG After reentering the LM, we could see the effects of our activity on the surface. *(Photo 30.)* You'll note that the surface looks considerably darker in the area where the majority of the walking took place. However, on the left side of the picture, where it is not as dark, there was also a good bit of walking. That indicates that the walking probably just increases your ability to notice the effects of the strange lighting that Buzz talked about earlier, where the cross-Sun lighting is a good bit darker than the down-Sun lighting.

ALDRIN Following the EVA, we had a sleep period, which in a word, didn't go quite as well as we thought it might. We found it was quite difficult to keep warm. When we pulled the window shades over the windows, we found that the environment within the cabin chilled considerably and after about two or three hours, we found that it was rather difficult for us to sleep. You see mounted in the right hand window, the 16-millimeter camera *(Photo 31),* that was mounted for taking the pictures on the surface. Following the sleep period, as we're approaching the lift-off point we progressed with a gradual power-up of the lunar module, which included another star alignment check, and as Mike came over in Columbia, one revolution before lift-off, we


30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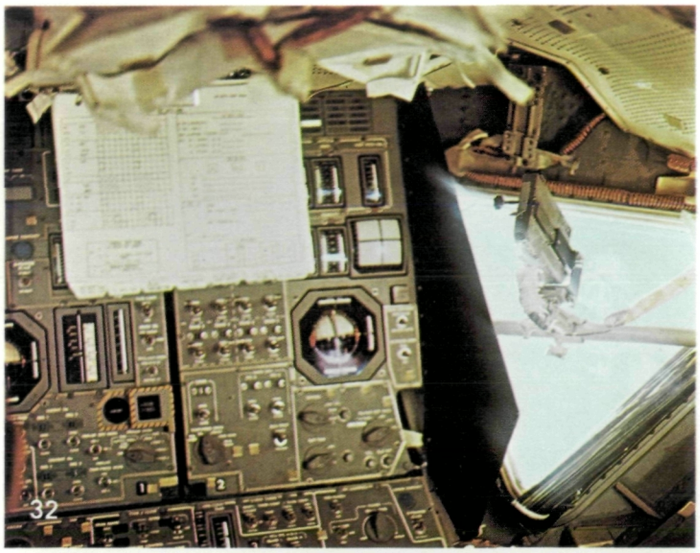

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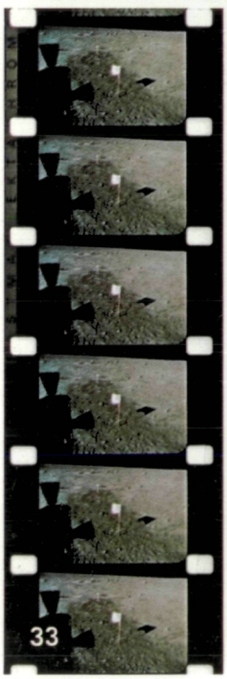

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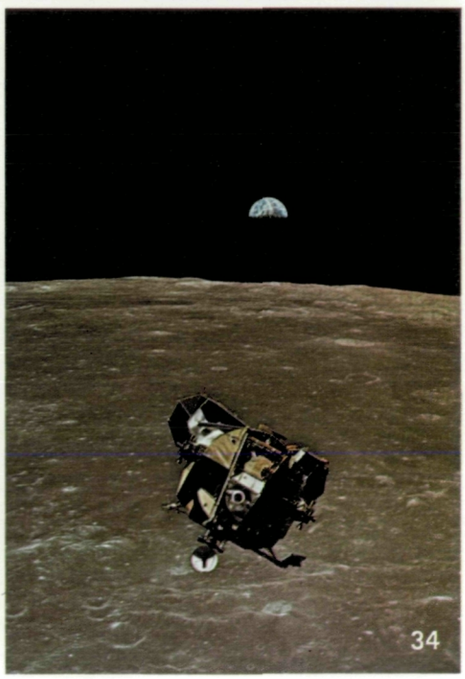

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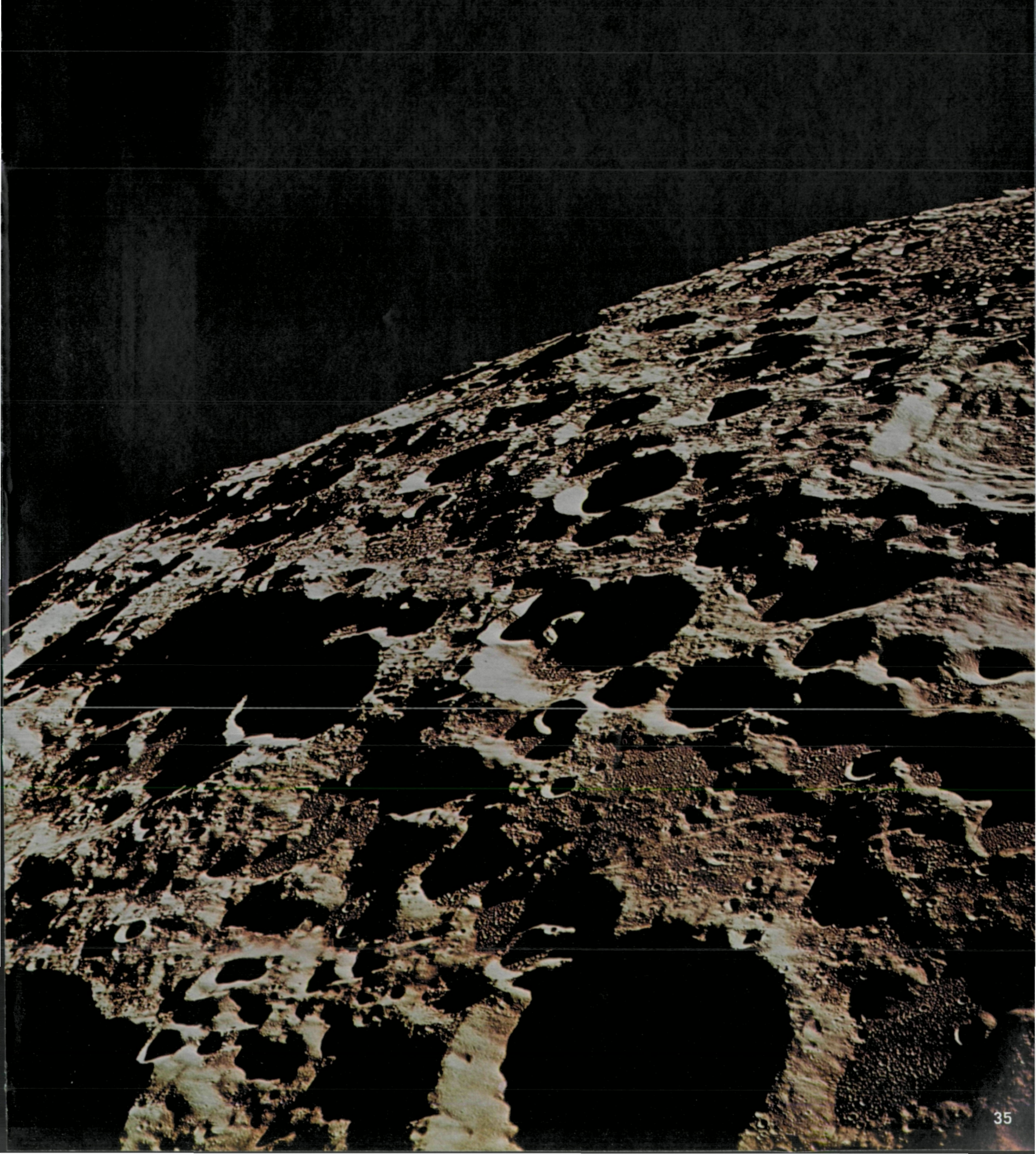
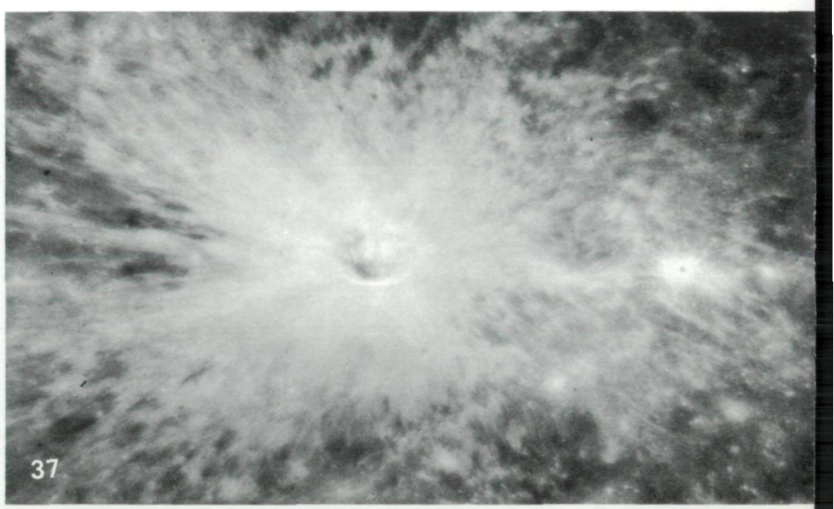
used the radar to track him as he went over. We continued the check out. You see here, one of the data books that's mounted up in front of the instrument panel *(Photo 32),* that was used to record the various messages that were sent up to us, a whole host of numbers, for the particular maneuvers that were coming up, that we would copy down. We would log these on that sort of a data sheet.

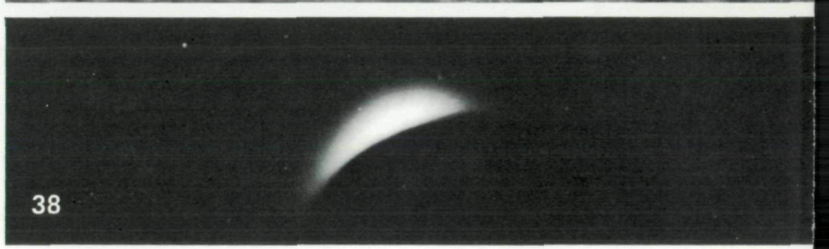
ARMSTRONG This film clip shows our final look at Tranquility Base *(Photo 33),* before our departure, and the ascent was a great pleasure. It was very smooth. We were very pleased to have the engine light up. (laughter) It gave us an excellent view of our takeoff trajectory, and Tranquility Base as we left, and at all times through the ascent, we could pick up landmarks that assured us that we were on the proper track. There were no difficulties with the ascent and we enjoyed the ride, more than we could say.

ALDRIN Both guidance systems agreed very closely when we were finally inserted into orbit. I believe they were something on the order of a half a mile, or seven-tenths of a mile difference in the apogee, in the resulting orbit. Following an alignment check after insertion into orbit, we proceded with gathering radar data of relative positions between the two vehicles. The solution for the first sequence of rendezvous maneuvers was extremely close and agreed very closely with the value that the ground had given us. The surprising feature was that many of us were expecting a fairly large out-of-planeness, due to perhaps some misalignment in azimuth on the surface. We were expecting somewhere up to, maybe 20 or 30 feet per second out-of-plane velocity. We found that we didn't even have to make use of a particular out-of-plane maneuver that had been inserted between two other sequential maneuvers. In comparison with many simulator runs, we found that this was about as perfect a rendezvous as we could have asked for.

COLLINS This is Eagle *(Photo 34),* or perhaps half an Eagle would be better since the landing gear and lower part of the descent stage, of course, remained on the surface. This was a very happy part of the flight for me. I, for the first time, really felt that we were going to carry this thing off at this stage of the game, and it looks like, although we were far from home, we were a lot closer to it than the pure distance might indicate. Neil made the initial maneuvers to get turned around, and then again I did the final







docking. The probe is the dark bundle on the top of the LM and the docking target is below it and to the left in the lighter portion of the LM. As Buzz said, the rendezvous was absolutely beautiful. They came up from below—as if they were riding on a rail. There was absolutely no disturbance or any off-nominal events during the last part of the rendezvous. Upper right you can see the RCS QUADS, and down below the various antenna and other protuberances. This gives you some idea of the rough surface available on the Moon. *(Photo 35.)* Of course, the maria on the front side are smoother than this, but in general the back side of the Moon is quite rough. I have a series of slides which, in the interest of time, I'm not going to dwell on, but I just like to point out that we did take a number of pictures, I believe, from Columbia. We took probably a thousand stills and some of them show very interesting surface features, various types of unusual craters, and some of them pose many riddles which we hope the geologists will, in time, be able to answer for us. That line of craters *(Photo 36),* for example, is difficult to explain; or at least without an argument it is. Here is a nearer crater with the white material having come from it. *(Photo 37.)* And this is a picture of the solar corona. *(Photo 38.)* Neil, would you like to close with that?

ARMSTRONG During our flight to the Moon, we flew through the Moon shadow, in fact the Moon was eclipsing the Sun. We took the opportunity to try to take some photographs of it but our film was just not sufficiently fast to capture the event. However, this does show the brightest part of the solar corona. It extends several Moon diameters on each side. They're roughly parallel to that light, but the striking thing to us, as observers, was not the solar corona, but the Moon itself. *(Photo 39.)* Of course, it

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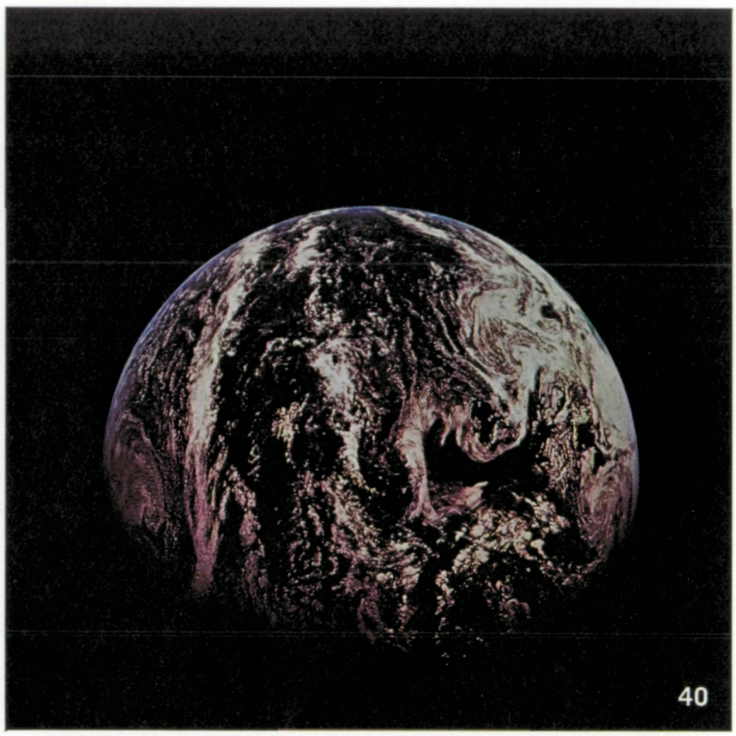

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was dark, unilluminated by the Sun but it was illuminated by the Earth and at this relatively close range it had a decided three-dimensional effect and was undoubtedly one of the most impressive sights of the flight. As we left the Moon, after successful TEI, this is the view that we observed. The colors that you see there are quite close to being actually representative of the Moon as seen from that distance. We were sorry to see the Moon go, but we were certainly glad to see that Earth return. *(Photo 40.)* We took a large number of photographs on the way out and back and had our wristwatches set on Houston time. An interesting use can be made of that. If you were looking at this picture and you looked at your watch and your watch said 7:00 in the evening, then you'd know that Houston is about 7:00 in the evening and it's about an hour away from sunset. So it would be about one-twenty-fourth of an Earth's circumference away from the shadow, which is just about 15 degrees there, so at anytime by looking at our wristwatch and looking down at the Earth, we knew what was underneath the clouds and it aided us in some ways in picking out what we should be seeing. We could see a large number of details on the Earth's surface, certainly all the continents and islands and details, many of which you followed perhaps in our discussions over the radio communications but it was interesting to us to find out how well we could observe weather patterns not only on the world wide scale that you see here, but in specific localities. This particular shot shows the coast of North America, the equatorial cloud layers, what we think is probably the intertropical conversion zone and cirrus clouds over the Antarctic.

SCHEER — We're ready now for questions and answers and wait for the microphone and we'll go right down the line and we'll catch everyone if you will just be patient.

REPORTER — *How much time did you have left in your life-support backpacks at the time you got back on board the LM?*

ARMSTRONG — I haven't seen the post-flight analysis of the numbers. We had roughly half of our available oxygen supply remaining in the backpacks and somewhat less percentage in the water supplies, which are used for cooling. Of course, particularly on our first experience with the use of that backpack on the lunar surface, we were interested in conserving a good bit of margin, in case we had difficulty with closing the hatch or repressuring the LM, or had any difficulties with getting the systems operating again in a normal fashion inside the cockpit.

REPORTER — *Colonel Aldrin and Mr. Armstrong; when President Nixon made his phone call to you on the Moon, it looked like the two of you suddenly stopped doing everything and stood there and listened and talked to him. It looked there for a moment like you might be a little bit aware of what was going on. Was there ever a moment on the Moon where either one of you were just a little bit spellbound by what was going on.*

ARMSTRONG — About 2½ hours.

REPORTER — *I'd like to ask Neil Armstrong when he began to think of what he would say when he put his foot down on the lunar surface and how long he pondered this—this statement about a small step for man, gigantic leap for mankind.*

ARMSTRONG — Yes, I did think about it. It was not extemporaneous, neither was it planned. It evolved during the conduct of the flight and I decided what the words would be while we were on the lunar surface just prior to leaving the LM.

REPORTER — *I'd like to ask Neil Armstrong and Buzz Aldrin, and I'm not quite sure how to ask this question, when you first stepped on the Moon, did it strike you as you were stepping—that you were stepping on a piece of the Earth, or sort of what your inner feelings were, whether you felt you were standing on a desert or that this was really another world, or how you felt at that point.*

ALDRIN — Well, there was no question in our minds, where we were. We'd been orbiting around the Moon for some time. At the same time we had experienced one-sixth G before. We've been exposed, to some degree, to the lighting that we saw. However, this was, in my case, an extremely foreign situation with the stark nature of the light and dark condition, and of course we first set foot on the Moon in the dark shadow of the area.

ARMSTRONG — It's a stark and strangely different place, but it looked friendly to me and it proved to be friendly.

REPORTER — *Some people have criticized the space program as a "Misplaced item on a list of national priorities." I'd like to ask any of the astronauts how do you view space exploration as a relative priority compared with the present needs of the domestic society and the world community at large.*

ARMSTRONG — Well, of course we all recognize that the world is continually faced with a large number of varying kinds of problems, and that it's our view that all those problems have to be faced simultaneously. It's not possible to neglect any of those areas, and we certainly don't feel that it's our place to neglect space exploration.

REPORTER — *There was a lot of discussion during the flight—during the power descent portion of the flight—about the program alarms and so forth. I wondered if you all could describe your thoughts on the subject, how it went and what advice you might have to offer the crews of Apollo 12 and subsequent flights for this portion of the mission?*

ALDRIN — Well, I think we pretty well understand what caused these alarms. It was the fact that the computer was in the process of solving the landing problem and at the same time we had the rendezvous radar in a powered-up condition and this tended to add an additional burden to the computer operation. Now I don't think either the ground people or ourselves really anticipated that this would happen. It was not a serious program alarm. It just told us that for a brief instant the computer was reaching a point of being overprogrammed or having too many jobs for it to do. Now a computer continually goes through a wait list of one item after another. This list was beginning to fill up and the program alarm came up. Unfortunately it came up when we did not want to be trying to solve these particular problems, but we wanted to be able to look out the window to identify the features as they came up so that we would be able to pinpoint just where, in the landing ellipse stage, the computer was taking us.

ARMSTRONG — Suppose we were carrying on a rapid fire conversation with the computer at that point, but we really have to give the credit to the control center in this case. They were the people who really came through and helped us and said "continue," which is what we wanted to hear.

REPORTER — *Gentlemen, you're about to take some tours. I wonder what your feelings are. Is that perhaps the most difficult part of the mission or are you looking forward to it?*

ARMSTRONG — It's certainly the part that we're least prepared to handle.

REPORTER — *What do you consider the most important piece of advice and recommendation that you will give the Apollo 12 crew before they take off for the Moon in November, gentlemen?*

ARMSTRONG — I didn't hear the first part. Recommendations for 12 in which?

REPORTER — *Which would be the most important piece of advice or recommendation for the Apollo 12 crew?*

ARMSTRONG I think that we can say that overall we wouldn't change the plan that we used or the plan that they intend to use. You know that there are a large number of individual details which we think could stand improvement and we have had the opportunity in the past couple of weeks to go over those details with the crew members and various people from around the program. In general I'd say that we wouldn't recommend any major changes in the plan.

REPORTER *Will you recommend any changes in procedures for the Moon-walking and exploration procedure and did you find that your suits were mobile enough in view of the changes or would you recommend further mobility features for them for operation on the Moon?*

ALDRIN Well, one gets used to the type mobility that your suit affords you and of course we would like to always have more and more dexterity with arms moving and fingers moving. These things are under study. Of course the Apollo 12 mission will have two different periods of EVA: one early in the mission, and then a sleep period, and then another EVA following that. We in general looked at their plans and we talked to them about the durations. We talked to them about a brief period at the beginning of their EVA for their familiarization with the EVA, the 160 environment. I don't think we have any particular recommendations for how they should change their mission. It is a continuing evolvement of EVA capability and scientific exploration that they're undertaking on that flight.

REPORTER *I would like to ask Colonel Aldrin if he would elaborate a little bit on his comment earlier about having to anticipate where you were going to walk three or four steps in advance as compared to just one or two on Earth. Did you mean that in respect to avoiding craters or deep pits or what?*

ALDRIN Well, I meant it with respect to the inertia that the body has in moving at this rate of five to six miles an hour that we found to be fairly convenient. Due to the reduced force of gravity your foot does not come down so often, so you have to anticipate ahead and control your body movement. and since you foot is not on the surface for a long period of time in each step you're not able to bring to bear large changes in your force application which would enable you to slow down. So in general we found we had to anticipate three or four steps ahead instead of maybe that one or two that you do on the surface of the Earth.

REPORTER *You are now national heroes and you've had a couple of weeks in isolation in the LRL to think about that. What are your initial feelings about being heroes? How do you believe it will change your lives and do you think that maybe you'll get another chance to go to the Moon or are you going to be too busy being heroes?*

ARMSTRONG Probably to get an answer to that question we might have to spend as long preparing as we had to prepare for Apollo 11. In the Lunar Receiving Laboratory we had very little time for meditation, as it turned out, we were quite busy throughout the time period with the same sort of things that the crews of past flights have done after their flights. The debriefing schedules and writing the pilot reports and getting all the facts down for the use of all the people who will include that in the future flights.

REPORTER *I'm struck from the movies and the still pictures by the difference in the very hostile appearance of the Moon when you're orbiting over it or some distance from it and the warmer colors and the relatively apparently more friendly appearance of it when you're on the surface. I'd like to ask Colonel Collins if he gets that same impression from the pictures and the two of you who were on the Moon, what impression do you have along those lines?*

COLLINS The Moon changes character as the angle of sunlight striking its surface changes. At very low Sun angles close to the terminator at dawn or dusk, it has the harsh, forbidding characteristics which you see in a lot of the photographs. On the other hand when the Sun is more closely overhead, the midday situation, the Moon takes on more of a brown color. It becomes almost a rosy looking place—a fairly friendly place so that from dawn through midday through dusk you run the whole gamut. It starts off very forbidding, becomes friendly and then becomes forbidding again as the Sun disappears.

REPORTER *Neil, were you and Buzz—did you get the feeling that you were getting a little low on fuel during the landing? Were you concerned at that point about being low on fuel; and the second part of it, I suppose for Buzz, is, out of your experience how tough do you think that pin-point precise landing will be on the lunar surface on future flights?*

ARMSTRONG Yes, we were concerned about running low on fuel. The range extension we did was to avoid the boulder field and craters. We used a significant percentage of our fuel margins and we were quite close to our legal limit.

REPORTER *What changes will be based on your experience?*

ALDRIN Well, I think it requires some very pinpoint determination of the orbit that the vehicle is in before it begins power descent. This requires extreme care in making sure of ground tracking because the entire descent is based upon the knowledge that the ground has and puts into the onboard computer exactly where the spacecraft is and this starts several revolutions before and then is carried ahead as the computer keeps track of the craft's position. So during sequences like undocking we have to be extremely careful that we do not disturb this knowledge of exactly where it is, because this then relates in the computer to bringing the LM down in a different spot than where everyone thought we were coming. This is what defines the error ellipse, where we might possibly land having targeted for the center. Now the ability to be able to control where you are requires that you be able

to identify features and, of course, in our particular landing site this was selected to be as void of significant features as possible to give us a smoother surface. In any area like this there are always certain identifying features that you can pick out —certain patterns of craters—to the extent that this can be used. If the crew sees that they are not going exactly toward the preplanned point, they can begin to tell the computer to move to a slightly different landing location. Now this can occur up in the region of 5 to 6 thousand feet. Then as Neil took over control of our spacecraft to extend the range to get beyond this large crater—West Crater—this again may be required if identification is made in the vicinity of 3, 4 or 5 hundred feet to be able to maneuver that last few seconds in the vicinity of 1000 or 2000 feet to make a pinpoint landing. So much depends on the early trajectory, the ability to then redesignate, and the final manual control.

REPORTER *For Mr. Armstrong and more on the landing. Did you at any time consider an abort while you were getting the alarms and so forth?*

ARMSTRONG Well, I think—in simulations we have a large number of failures and we are usually spring-loaded to the abort position and in this case, in the real flight, we are spring-loaded to the land position. We were certainly going to continue with the descent as long as we could safely do so and as soon as program computer alarms manifest themselves, you realize that you have a possible abort situation to contend with, but our procedure throughout the preparation phase was to always try to keep going as long as we could so that we could bypass these types of problems.

ALDRIN The computer was continuing to issue guidance throughout this time period and it was continuing to fly the vehicle down in the same way that it was programmed to do. The only thing that was missing during this time period is that we did not have some of the displays on the computer keyboard and we had to make several entries at this time in order to clear up that area.

REPORTER *Would the crew consider a Moon mission of a similar nature again or would you prefer to have some other kind of mission; and secondly, I think this question was asked, but I did not get the complete answer. How do you propose to restore some normalcy to your private lives in the years ahead?*

ALDRIN I wish I knew the answer to the latter part of your question.

ARMSTRONG It kind of depends on you. But I think that the landings that are presently considered for the next number of flights are appropriate to the conclusions that we reached as a result of our descent. I would certainly hope that we are able to investigate the variety of types of landing sites that they hope to accomplish.

REPORTER *I have two brief questions that I would like to ask, if I may. When you were carrying out that incredible Moon walk, did you find that the surface was equally firm everywhere or were there harder and softer spots that you could detect. And, secondly, when you looked up at the sky, could you actually see the stars in the solar corona in spite of the glare?*

ALDRIN The first part of your question, the surface did vary in its thickness of penetration somewhere in flat regions. The footprint would penetrate a half an inch or sometimes only a quarter of an inch and gave a very firm response. In other regions near the edges of these craters we could find that the foot would sink down maybe 2, 3, possibly 4 inches and in the slope, of course, the various edges of the footprint might go up to 6 or 7 inches. In compacting this material it would tend to produce a slight sideways motion as it was compacted on the material underneath it. So we feel that you cannot always tell by looking at the surface what the exact resistance will be as your foot sinks into a point of firm contact. So one must be quite cautious in moving around in this rough surface.

ARMSTRONG We were never able to see stars from the lunar surface or on the daylight side of the Moon by eye without looking through the optics. I don't recall during the period of time that we were photographing the solar corona what stars we could see.

ALDRIN I don't remember seeing any.

REPORTER *Neil, you said you were a little bit concerned you said about stubbing your toe at the point of landing because the surface was obscured by dust. Do you see any way around that problem for future landings on the Moon?*

ARMSTRONG I think the simulations that we have at the present time to enable a pilot to understand the problems of a lunar landing (that is, the simulator and the various lunar landing training facilities and trainers that we have) will do that job sufficiently well. Above that, I think it is just a matter of pilot experience.

REPORTER *This is for Neil Armstrong. You said earlier in your presentation that Maskelyne W. occurred about three seconds later giving you the clue that you might land somewhat long. Now this was before you got the high gate so that it had nothing to do with maneuvering to find a suitable place to land. I am wondering what would have caused this three seconds delay. Did it have something to do with the time that you began the powered descent or what?*

ARMSTRONG The time that we started powered descent was the planned time but the question is where are you over the surface of the Moon at the time of ignition and where that point is, is largely determined by a long chain of prior events: tracking that has taken place several revolutions earlier, the flight maneuvers that have been done in checking out the rate control systems, the undocking and the ability to station-keep accurately without ever flying very far away from where the computer thinks you ought to be at that time. And, of course, the little bit of dispersions in a maneuver such as the deal I burned on the back side of the Moon that were not quite properly measured by the guidance system. Each of those things will accumulate into an effect that is an error—a position error—at ignition and there is no way of compensating until you get to final phase for that error.

REPORTER *Based on your own experiences in space, do you or any of you feel that there will ever be an opportunity for a woman to become an astronaut in our space program?*

ARMSTRONG Gosh, I hope so.

REPORTER *I would like to refer back to something that Neil Armstrong said a while back, that there was so many other things he would have liked to have done. As it was, you ended up a considerable number of minutes behind the schedule. Is that because the schedule was overloaded for the EVA or can we expect all astronauts, when they reach the Moon for the first time, to enjoy themselves and spend as much time doing so as you seemed to?*

ARMSTRONG We plead guilty to enjoying ourselves. As Buzz mentioned earlier, we are recommending that we start future EVA's with a 15- or 20-minute period to get these kinds of things out of the way and to get used to the surface and what you see, adapt to the 1/6 G in maneuvering around and probably we just included a little more in the early phase than we were actually able to do.

REPORTER *Two questions. Where did the weird sounds including the sirens and whistles come from during the transEarth coast. I believe ground control had asked for explanations saying it had come from the spacecraft. Secondly, I understand that although low-angle lighting caused no problem walking around, there was a problem seeing obstacles in time when traveling at high speeds. I understand this might indicate the need for flying machines rather than a rover for long distance lunar surface travel. Can you explain this?*

ARMSTRONG We are guilty again. We sent the whistles and—(Laughter) and bells—with our little tape recorder which we used to record our comments during the flight in addition to playing music in the lonely hours. We thought we'd share that with the people in the Control Center. The Sun angle was less a problem for the things you mentioned than the lunar curvature and the local roughness. It seemed to me as though it was like swimming in an ocean with 6-or 8-foot swells and waves. In that condition, you never can see very far away from where you are. And this was even more exaggerated by the fact that the lunar curvature is so much more pronounced.

REPORTER *This is for Mr. Armstrong. Had you planned to take over semi-manual control, or was it only your descent toward the West Crater that caused you to do that?*

ARMSTRONG The series of control system configurations that were used during the terminal phase were in fact very close to what we would expect to use in the normal case, irrespective of the landing area that you found yourself in. However, we spent more time in the manual phase than we would have planned in order to find a suitable landing area.

REPORTER *Many of us and many other people in many places have speculated on the meaning of this first landing on another body in space. Would each of you give us your estimate of what is the meaning of this to all of us?*

ARMSTRONG You want to try it?

ALDRIN After you.

ALDRIN Well, I believe, that what this country set out to do was something that was going to be done sooner or later whether we set a specific goal or not. I believe that from the early space flights, we demonstrated a potential to carry out this type of a mission. And again it was a question of time until this would be accomplished. I think the relative ease with which we were able to carry out our mission which, of course, came after a very efficient and logical sequence of flights . . . I think that this demonstrated that we were certainly on the right track when we took this commitment to go to the Moon. I think that what this means is that many other problems, perhaps, can be solved in the same way by making a commitment to solve them in a long time fashion. I think, that we were timely in accepting this mission of going to the Moon. It might be timely at this point to think in many other areas of other missions that could be accomplished.

COLLINS To me there are near and far term aspects to it. On the near term, I think it a technical triumph for this country to have said what it was going to do a number of years ago, and then by golly do it just like we said we were going to do . . . not just, perhaps, purely technical, but also a triumph for the nation's overall determination,

will, economy, attention to detail, and a thousand and one other factors that went into it. That's short term. I think, long term, we find for the first time that man has the flexibility or the option of either walking this planet or some other planet, be it the Moon or Mars, or I don't know where. And I'm poorly equipped to evaluate where that may lead us to.

ARMSTRONG I just see it as beginning, not just this flight, but in this program which has really been a very short piece of human history—an instant in history—the entire program. It's a beginning of a new age.

REPORTER *Neil, how much descent fuel did you have left when you actually shut down?*

ARMSTRONG My own instruments would have indicated less than 30 seconds, probably something like 15 or 20 seconds, I think. The analyses made here on the ground indicate something more than that, probably greater than 30 seconds—40 or 45. That sounds like a short time, but it really is quite a lot.

REPORTER *This is for Colonel Collins. You used a rather colorful expression when there seemed to be some problem with docking. Could you tell us precisely what was going on at that time? Were you docked and then—*

COLLINS Are you referring to the lunar orbit docking when after the two vehicles made contact, a yaw oscillation developed? This oscillation covered, perhaps, 15 degrees in yaw over a period of one or two seconds and was not normal. It was not anything that any of us expected. It was not a serious problem. It was all over in an additional six or eight seconds. The sequence of events is that the two vehicles are held together initially by three capture latches and then a gas bottle, when fired, initiates a retract cycle which allows the two to be more rigidly connected by 12 strong latches around the periphery of the tunnel. Now this takes six or eight seconds for this cycle, between initial contact and the retract. And it was during this period of time, that I did have a yaw oscillation, or we did. Neil and I both took manual corrective action to bring the two vehicles back in line. And while this was going on the retract cycle was successfully taking place. And the latches fired, and the problem was over.

REPORTER *Two questions. Col. Aldrin, the pictures taken on the surface, your fold portrait, show the distinct smudges of lunar soil on your knees. Did you fall down on the surface or kneel? And then for Mr. Armstrong, during the last few minutes there, before the landing when the program alarms were coming on and et cetera, would you have gone ahead and landed had you not had ground support?*

ALDRIN To my recollection, my knees did not touch the surface at any particular time. We did not feel that we should not do this. We felt that this would be quite a natural thing to do to recover objects from the surface, but at the same time we felt that we did not want to do this unless it was absolutely necessary. We found quite early in the EVA that the intersurface material did tend to adhere considerably to any part of the clothing. It would get on the gloves and would stay there. When you would knock either your foot or your hand against something, you would tend to shed the outer surface of this material, but there remained considerable smudges. I don't know how that got on the knees.

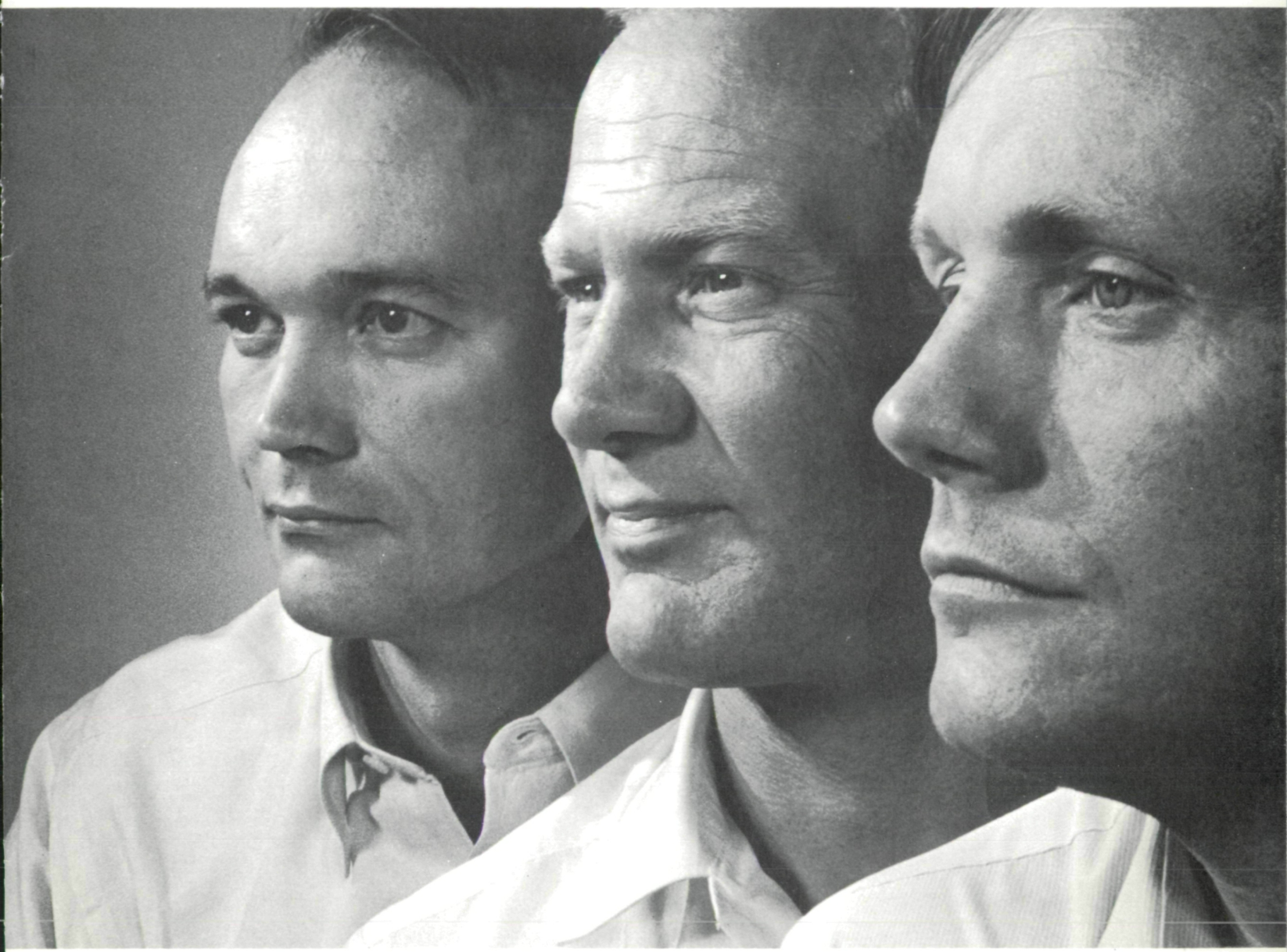
ARMSTRONG Neither of us fell down. We would have continued the landing so long as the trajectory seemed safe. And a landing is possible under these conditions, although with considerably less confidence than when you have the information from the ground, and the computer in its normal manner is available to you.

REPORTER *For Mr. Armstrong and Col. Aldrin. Would you please give us a bit more detail about your feelings, your reactions, your emotions during that last several hundred feet of powered descent? Especially when you discovered that you were headed for a crater full of boulders and had to change your landing spot.*

ARMSTRONG Well, first say that I expected that we would probably have to make some local adjustments to find a suitable landing area. I thought it was highly unlikely that we would be so fortunate as to come down in a very smooth area, and we planned on doing that. As it turned out, of course, we did considerably more maneuvering close to the surface than we had planned to do. And the terminal phase was absolutely chock full of my eyes looking out the window, and Buzz looking at the computer and information inside the cockpit and feeding that to me. That was a full-time job.

ALDRIN My role during the latter two hundred feet is one of relaying as much information that I can that is available inside the cockpit in the form of altitude, altitude rate, and forward or lateral velocity. And it was my role of relaying this information to Neil so that he could devote most of his attention to looking out. What I was able to see in terms of these velocities and the altitudes appeared quite similar to the way that we had carried out the last two hundred, one hundred feet in many of our simulations.

Thus ended the Apollo 11 post-flight press conference. Twenty-seven days elapsed between liftoff at Cape Kennedy and this report to the people. Only history will bear witness to the importance of the events that took place during this period.



Command Module Pilot
Michael Collins

Lunar Module Pilot
Edwin E. (Buzz) Aldrin, Jr.

Commander
Neil Armstrong

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This book was a project of Murray Nathans of NASA who died on January 28, 1970, and is dedicated to him.

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